EVALUATION REPORT ON

INSULATING BLANKETS FOR

DOMESTIC HOT WATER HEATERS

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C O N T E N T S

		Page
A.	Purpose	1
B.	Background	1
	1. Existing Situation	1
	2. Types Manufactured	1
	3. Sources of Data	1
C.	Policies Regarding Insulating Blankets	2
	1. Ontario Hydro	2
	2. Natural Gas Companies	2
	3. Ministry of Energy	2
D.	Economic Analysis	3
	1. Electric Domestic Hot Water Heaters	3
	2. Natural Gas Fired Domestic Hot Water Heaters	4
E.	Conclusions & Recommendations	4
	Appendix 1	
	Appendix 2	

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A. PURPOSE

To evaluate insulating blankets for domestic hot water heaters used in houses. To establish guidelines for their selection, installation and maintenance in OHC houses.

B. BACKGROUND

(1) Existing Situation

Domestic hot water tanks store hot water between 52°C (125°F) and 63°C (145°F) most of the daytime and throughout the night. The addition of an insulating blanket, which is wrapped and secured around the tank is proposed, to decrease the standby heat loss and therefore reduce energy consumption by the heater. It must be noted that the tanks have insulation in them when manufactured.

There are 22,300 houses in the total OHC portfolio of which 2,280 are singles, 3,550 are semi-detached and 16,470 are row houses. All singles and semi-detached have hot water tanks for which this product is manufactured. Some row houses are supplied with hot water from a large central system whose tanks are not suitable for insulation with this product.

(2) Type Manufactured

Currently, there is only one type of insulating blanket manufactured; Glas-Jacket is a 100% Canadian product consisting of a 76 mm (3") thick fiberglass, low density insulation (Johns-Manville Microlite) with a vinyl facing. The heat transfer resistance is RSI-1.76 (R-10).

This product has been certified by the Canadian Gas Association (CGA) for new and retrofit applications on standard domestic gas fired water heaters and by the Canadian Standards Association (CSA) for new and retrofit applications on CSA Performance Certified Electric Water Heaters only (CSA C191 series).

(3) Sources of Data

Information was obtained from:

1. "Evaluation Report on an Energy Conservation Product - Domestic Hot Water Tank Insulating Jacket" May, 1981 Ministry of Housing, Maintenance Engineering Branch.

2. "A Study to Determine the Effectiveness and Safety of External Insulating Blankets on Water Heaters" November, 1986 ASHRAE Research Project.

3. "Insulating Blankets for Domestic Hot Water Heaters" November, 1986 Canadian General Standards Board.

4. "Impact of the Hood River Conservation Project on Electricity Use for Residential Water Heating" October, 1987 - U.S. Department of Energy.

5. Ontario Hydro

6. B.C. Hydro

7. Canadian Gas Association

8. Consumers Gas

9. Union Gas

10. Canadian Standards Association

11. Manufacturers

C. POLICIES REGARDING INSULATING BLANKETS

(1) Ontario Hydro

Considering promoting the blankets in the near future. Blanket can be installed by the home owner.

(2) Natural Gas Companies

Not actively promoting the blankets. They prefer that gas company personnel install them. If blanket is owner or contractor installed, gas company inspection of completed installation is not required.

(3) Ministry of Energy

Providing funding to include this product in the Canadian Retail Hardware Dealer Association staff training video.

D. ECONOMIC ANALYSIS

(1) Electric Domestic Hot Water Heaters

The heat loss of the Cascade 40, electric domestic hot water heater is 115 W. (Note that 80% of electric heaters are 182L (40 Imp. Gal. size). This equals (115 x 8,760) or 1,000 kWh/yr standby loss. Ontario Hydro's testing of a 76 mm (3") thick fiberglass insulating blanket showed a saving of 28% under typical operating conditions.

(a) House with Electric Furnace/Baseboard

Space heating of houses is required for about 8 out of 12 months per year. Assuming 100% of the standby heat loss from the heater contributes to space heating, energy savings attributed to the insulating blanket installed on the water heater could occur only during the four non-space heating months. This equals (28% x 4/12) or approximately 10% of the yearly standby loss or 100 kWh/yr. Based on a present average cost of approximately $0.07/kWh for houses across Ontario, the savings would amount to $7.00/year and a simple payback of 8 years.

(b) House with Natural Gas Furnace

Savings of $7.00 (as noted above) occur for the 4 month non-space heating season.

For a gas fired space heating system: during the 8 month heating season, heat saved by the blanket on the electric DHW heater is (1,000 x 28% x 8/12) or approximately 200 kWh. The cost for this energy at the average cost of electricity of approximately $0.07/kWh is $14.00.

However, the 200 kWh saved will have to be produced by a gas fired furnace, with a seasonal efficiency of 70%; at an average equivalent cost of gas of approximately $0.027/kWh, this cost is $5.40. The net saving is ($14.00 - $5.40) or $8.60 for the heating season.

The manufacturer has quoted $29.95 retail per blanket, with sales tax (at 8%) of $2.40 and installation cost estimated at $23.00, total installed cost is approximately $55.35. Total saving is ($7.00 + $8.60) or $15.60/yr. The simple payback is ($55.35/$15.60) or 4 years.

(2) Natural Gas Fired
Domestic Hot Water Heaters

(a) House with Natural Gas Furnace

Normally, natural gas domestic hot water heaters are equipped with 25 mm (1") insulation versus 50 mm (2") insulation for electric heaters. Note that 90% of gas heaters are 182L (40 Imp. Gal.) size.

Therefore, if a 182L (40 Imp. Gal.) electric heater loses 115W, we can say that a 182L (40 Imp. Gal.) gas heater loses 230W or (230 x 8,760) or 2,000 kWh/yr standby loss. Tests of insulating blankets show 14% savings under typical operating conditions.

Space heating of houses is required for about 8 out of 12 months per year. Assuming 100% of the standby heat loss from the heater contributes to space heating, energy savings attributed to the insulating blanket installed on the water heater would occur only during the 4 non-space heating months.

This equals to (14% x 4/12) or approximately 5% of the yearly standby loss or 100 kWh/yr. Based on a present average equivalent cost of gas of approximately $0.027/kWh for houses across Ontario, the savings would amount to $2.70/yr.

The manufacturer has quoted $27.95 retail per blanket with sales tax (at 8%) of $2.25 and installation cost estimated at $23.00, total cost is approximately $53.20. The simple payback is ($53.20/$2.70) or 20 years.

E. CONCLUSIONS & RECOMMENDATIONS

1. For each heating type, the following savings (rounded to the nearest dollar) result if an insulating blanket is installed on a DHW heater:

(1) $ 7/year - house with electric DHW heater and electric furnace/baseboard.

(2) $16/year - house with electric DHW heater and gas furnace.

(3) $ 3/year - house with gas DHW heater and gas furnace.

2. Analysis shows that insulating blankets cannot be justified in OHC houses. Housing units incorporating electric domestic hot water heaters and gas fired space heating are virtually non-existent in the OHC portfolio. In all electric houses, the simple payback is 8 years, which is unacceptable. In housing units incorporating gas fired domestic hot water heaters and gas fired space heating, the simple payback is 20 years, which is unacceptable. Accordingly, the use of insulating blankets cannot be justified on an economic basis for OHC houses.

3. As previous manufacturers have stopped production of blankets, having only one manufacturer is not a desirable situation.

4. The installation and maintenance of insulating blankets is dependent on numerous criteria which must be strictly followed for the safe operation of the water heaters. The guidelines, as outlined in Appendix 1, must be strictly adhered to.

APPENDIX 1

INSULATING BLANKETS
INSTALLATION AND MAINTENANCE GUIDELINES

Guidelines must be strictly followed for safe operation. Proper maintenance, as scheduled, must be performed:

(1) Insulating Blankets Used on Natural Gas or Propane Fired Domestic Hot Water Heaters

1. Insulating blankets to be installed only on standard domestic hot water heaters that meet the installation criteria of the Canadian Gas Association. These heaters comply to CANI-4.1-M85 Gas Fired Automatic Storage Type Water Heaters with Inputs less than 75,000 Btuh (22 kW).

2. Blankets are suitable for standard model heaters only. Blankets should not be placed on water heaters that have factory installed insulation thicker than 25 mm (1") because of potential problems with overheating. If in doubt about insulation, refer to owner's manual.

3. Blankets are to be applied only to 182L (40 Imp. Gal.) and 227L (50 Imp. Gal) tanks.

4. Blankets are allowed to be applied on both customer owned and company rental tanks.

5. Blankets are not for use on side vented gas fired water heaters.

6. Thermostat setting must not exceed 60°C (140°F) or medium setting. It should be set below 60°C.

7. Do not extend the blanket below bottom of burner operating control around full circumference of tank.

8. Combustion air to heater must not be restricted. Combustion chamber and burner access cover must not be covered. If covered, high levels of carbon monoxide will be created in the flue gases.

9. No insulation is to be placed on top of tank. Ensure that blanket does not interfere with proper venting of heater. If the vent is covered, explosive damage caused by restricted airflow can result.

10. Blanket shall be cut in a manner that will leave the burner operating control and temperature/pressure relief valve (if valve is on side of tank) unobstructed and free to operate as intended. Drain valve must be exposed. Blanket shall be installed so that the drop line or other piping connected to the outlet of the temperature/pressure relief valve are outside of it.

11. Blanket shall be provided with permanent openings that will expose the water heater rating plate, instruction plate, rental sticker, clearance to combustible sticker and any other warning, safety or information sticker that may be attached to the water heater casing.

12. Blanket must not be installed on and must be removed immediately from leaking tank.

13. Check tension of straps holding blanket. Tighten buckles at least once a year to prevent blanket from slipping down to cover burner area. Tape of any type is not acceptable as the sole means to secure the side seams together or to secure the blanket to the water heater.

14. Cautionary sticker incorporating main features of above items should be provided and displayed in prominent location on installed blanket.

(2) Insulating Blankets Used on
<u>Electric Domestic Hot Water Heaters</u>

1. Insulating blankets to be installed only on standard domestic hot water heaters that meet the installation criteria of the Canadian Standards Association. These heaters comply to C22.2 No. 110 Construction and Test of Electric Storage Tank Water Heaters and C191 Series-Standard on Performance of Electric Storage Tank Water Heaters.

2. Blankets are suitable for standard model heaters only. Blankets should not be placed on water heaters that have factory installed insulation thicker than 50 mm (2") because of potential problems with overheating. Blankets not for use on energy efficient electric powered hot water heaters. If in doubt about insulation, refer to owner's manual.

3. Blankets are to be applied only to 182L (40 Imp. Gal.) and 270L (60 Imp. Gal.) tanks.

4. Thermostat setting must not exceed 60°C (140°F) or medium setting. It should be set below 60°C.

5. Thermostat should be supplied by minimum 12 gauge (equivalent to 2 mm diameter) copper wiring. If in doubt about wiring, contact the local utility or electrician.

6. Do not cover electric service connection box with the blanket. Heater should be serviced with 90°C (194°F) rated wire so that, in the event a blanket is installed improperly, the wire will not exceed its rating in the service connection box. Wire rated at 60°C (140°F) could presumably be connected to the box.

7. Blanket shall be cut in a manner that will leave the temperature/pressure relief valve unobstructed and free to operate as intended. Blanket shall be installed so that the relief valve overflow pipe is outside of it.

8. Blanket shall be provided with permanent openings that will expose the water heater rating plate, instruction plate, rental sticker and any other warning, safety or information sticker that may be attached to the water heater casing.

9. Blanket must not be installed on and must be removed immediately from leaking tank.

10. Check blanket at least once a year to ascertain that the blanket has not slipped and covered the electric service connection box.

11. Cautionary sticker incorporating main features of above items should be provided and displayed in prominent location on installed blanket.

(3) Installation

1. Blanket requires special handling because of the health hazard of fiberglass. Insulation may cause temporary skin irritation. Wash with soap and warm water after handling. Wear loose clothing. Wash work clothes separately.

2. Preference should be given to installation by a tradesman. An incorrect application could cause trouble.

3. Hand clearance is needed all around the tank.

4. Surface could easily be torn since the vinyl is thin. This is a disadvantage.

5. On electric heaters, access for replacing the elements needs the removal and replacement of the blanket each time. This is a disadvantage.

APPENDIX 2

DOMESTIC HOT WATER HEATER INSULATING BLANKETS AND MANUFACTURER CONTACTS

Manufacturer	Model	Contact
David Latchford Inc.	Glas-Jacket	Mr. David Latchford (416) 945-9106